

The claimed invention is:

1. A conveyor oven control comprising an energy management system for controlling a flowing stream of hot air through an oven for baking a food product; a conveyor extending through said cavity for conveying said food product through said oven; a gas line for conveying gas from a source to a burner in said oven; said energy management system being interposed in said gas line and between said source and said burner for modulating a flow of gas to said burner; said energy management system comprising a controller, a signal conditioner, and an ignition module; a safety shut down valve associated with said ignition module to prevent said ignition module from re-igniting said burner during hazardous conditions; a pair of sensors in said oven for sensing instantaneous oven temperatures; said controller being responsive to said sensed temperatures for controlling said energy management system to regulate an operation of the modulating valve and the flow of gas to the burner in order to maintain oven temperature within a predetermined range, said signal conditioner being responsive to said controller for providing signals that control said modulating valve; and said controller, said signal conditioner, and said ignition module, being electrically isolated from each other to prevent an electrical feed back between them which might otherwise defeat the safety shut down valve.

2. The conveyor oven of claim 1 wherein said energy management system includes a modulating valve comprising a diaphragm closing a chamber having an internal pressure controlled by fluctuations of oven temperatures, a main valve in said modulating valve coupled to move with said diaphragm for regulating an amount of gas flowing from said source through said gas line to said burner in response to movement

of said diaphragm, and a tap line for applying said pressure in said chamber acting on said diaphragm in response to said sensors whereby the flow of said gas through said main valve in said modulating valve to said burner is regulated as a function of said instantaneous oven temperature.

3. The oven of claim 2 and a by-pass line for enabling a limited amount of gas to flow around said main valve of said modulating valve whereby said burner continues to burn and does not shut down while said main valve is closed.

4. The oven of claim 1 wherein said burner heats air in a plenum at an input end of said oven from which hot air is driven through said cavity, said sensors being located at different places in a plenum.

5. A conveyor oven for automatically baking a food product over a timed period under the control of an energy management system, said oven comprising a cavity having a burner associated therewith for providing heated air in said cavity, a gas line for delivering gas to said burner via said energy management system, said burner heating air in a plenum, a system for delivering said stream of heated air from said plenum through said cavity and return to said plenum, a pair of sensors at different locations in said plenum for sensing an instantaneous temperature of said heated air in said plenum, a valve for modulating the amount of gas delivered to said burner responsive to said sensed instantaneous oven temperature, said delivered gas comprising at least a minimum amount of gas so that said burner means remains in continuous operation regardless of said modulation of gas delivered to said burner, a controller responsive to said sensors for providing signals for regulating said modulating valve, a signal conditioner, and an ignition module electrically isolated from each other,

said signal conditioner converting said signals provided by said controller into control signals for operating said modulating valve, said electrical isolation preventing said ignition module from maintaining said burner during a hazardous condition.

6. The oven of claim 5 and a conveyor for delivering a food product through said cavity over a timed period during which said burner continuously delivers heat to said cavity, said heat baking said product as it is conveyed through said oven, and a line for by-passing said minimum amount of gas around said modulating valve in order to prevent said burner means from shutting down during periods while said controller is not calling for heat.

7. The oven of claim 6 wherein said signal conditioner is responsive to said controller for producing signals required for operating said modulating valve to maintain a uniform heat, and a pair of transformers, one transformer being coupled to energize said conditioner and the other transformer being coupled to energize said ignition module whereby an electrical feed back between said conditioner and ignition module is prevented.

8. An energy management system for a conveyor that bakes a food product during a passage through said oven, said energy management system comprising a modulating system for delivering a flowing stream of hot air from a burner and over said food product during said passage, a controller for sensing and regulating the temperature of said stream of hot air, a signal conditioner responsive to said controller for producing signals required to operate said modulation system, whereby said burner delivers heat jointly responsive to said controller and said conditioner, an electrical isolation located between said controller, said signal conditioner, and said ignition

module to prevent an electrical feed back signal between them, whereby said ignition module cannot re-ignite said burner responsive to a feed back signal that might otherwise appear in the absence of said isolation.

9. The system of claim 8 wherein said isolation is provided by a pair of transformers, one of said transformers delivering power to said conditioner, and the other of said transformers delivering power to said ignition module, and a safety valve which automatically shuts down during hazardous conditions whereby there is no feed back between said controller and said conditioner via said transformers which feed back might otherwise defeat said safety valve.

10. The system of claim 9 wherein said modulating system comprises a modulating valve having a pressure chamber closed by a diaphragm which expands and contracts in response to the pressure in said chamber, said pressure increasing and decreasing in said chamber jointly responsive to said controller and as a function of the temperature of said stream of hot air, a gas line, and a valve in said gas line, said valve being connected to said diaphragm whereby said valve opens and closes as said diaphragm expands and contracts in order to modulate a flow of gas in said line.

11. The system of claim 10 and a by-pass line around said valve, said bypass line delivering enough gas to continuously maintain said burner in at least a minimum heat condition despite operation of said valve responsive to said diaphragm.

12. A conveyor oven comprising a modulating gas valve for supplying heat to said oven; a controller; a signal conditioner for converting signals from said controller into signals for operating said modulating valve; an on/off safety valve in said gas line to automatically shut down said oven during predetermined conditions; an ignition module

for igniting gas delivered by said safety valve; and an electrical control circuit for operating said valve, controller, conditioner, and ignition module, said circuit having a first section relating to mechanical parts of the oven and a second section relating to energy management of heat delivery in said oven, and said electrical control circuit having electrical isolation for preventing a feed back of electrical signals which might prevent shut down of the safety valve during said predetermined conditions.

13. The oven of claim 12 wherein said first section includes at least a conveyor speed controller and safety interlocking contacts for mechanical parts and said second section includes first and second transformers coupled in parallel to provide said isolation between their secondary windings, one of said secondary windings supplying power to said conditioner and the other of said secondary windings supplying power to said ignition module, said safety valve being coupled to supply gas via said ignition module.

14. The oven of claim 13, and a pair of sensors for detecting heat in said oven, said sensors being coupled to drive said controller, said signal conditioner being coupled to operate said modulating gas valve, and a coupling from said controller to conditioner whereby heat detected by said sensors controls said modulating valve.